RTCA Special Committee 209

ATCRBS Transponder MOPS Maintenance

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Transponder Response to Equipment Operating with "Whisper-Shout" Mode

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SUMMARY

This Working Paper proposes a requirement to be added to DO-144A. The problem has originally been found in the Mode S transponder, but as it refers to Mode C operation, it should also be addressed in DO-144A.

Problem overview:
TCAS I equipment uses a “whisper-shout” mode to distinguish between transponders operating at different distances. This is done by generation of a Mode C interrogation preceded by an additional pulse (name it Px) which is positioned 2 µs before P1 of Mode C interrogation and is 3 dB lower than P1. Such a pulse combines with P1 into suppression pair, due to 2 µs distance.

The expected operation of the transponder depends on signal level received by the transponder:

Px	**P1 and P3**	**Expected transponder behavior**
Below MTL	Below MTL	Does not reply due to signal level
Below MTL	Above MTL	Transponder replies with some efficiency
Above MTL	Above MTL	Does not reply due to suppression

The drawback is that there is no requirement which addresses such operation. This led to some transponder designs which were unable to operate with TCAS I.

Proposal of requirement:
The transponder **shall** reply to 70% or more interrogations when the interrogation is at MTL and is preceded by a Px pulse at MTL –3 dB positioned 2 µs before P1 pulse of the interrogation.